

What is claimed is:

1. A antenna apparatus, comprising:

a digital communications channel for receiving a digital control signal

including antenna pattern position control information;

control circuitry, coupled to the digital communications channel, the

control circuitry including a direction control device for generating at least one antenna

pattern position control signal from said digital control signal; and

a controllable antenna element assembly having a steerable antenna

pattern including a plurality of lobes and at least one null, the controllable antenna

element assembly being responsive to said at least one antenna pattern position control

signal.

2. The apparatus of claim 1, wherein said digital communications channel is a serial

bus.

3. The apparatus of claim 1, wherein said communications channel is implemented

using a coaxial cable also used to output signals received by said controllable antenna

element assembly.

4. The apparatus of claim 1,

wherein said digital control signal includes an antenna position portion

and a gain control portion, and

wherein the control circuitry includes a gain decoder for generating a gain

control signal as a function of the gain control portion of said control signal.

5. The apparatus of claim 4,

wherein said digital control signal further includes a channel number

portion, and

4 wherein the control circuitry further includes channel number processing
5 circuitry for generating a tuning voltage as a function of the channel number portion of
6 said digital control signal.

1 6. The apparatus of claim 5, further comprising a tuning circuit coupled to said
2 antenna element assembly, the tuning circuit being responsive to the tuning voltage.

1 7. The apparatus of claim 4,
2 wherein said digital control signal further includes a polarization control
3 portion, and
4 wherein the control circuitry further includes a polarization control circuit
5 coupled to said antenna element assembly.

1 8. The apparatus of claim 6, further comprising:
2 a memory device including antenna capabilities information.

1 9. The apparatus of claim 8, wherein said controllable antenna element assembly
2 includes:
3 a plurality of individual antenna elements; and
4 at least one switch being coupled to each of the individual antenna
5 elements, each switch being coupled to said direction control device.

1 10. The apparatus of claim 8, wherein said control circuitry includes at least one
2 integrated circuit for performing a decoding operation on at least a portion of said digital
3 control signal.

1 11. The antenna apparatus of claim 10, further comprising a coupling device
2 including at least three connections, the first connection for coupling said digital
3 communication channel to a control line of a receiver, the second connection for coupling
4 said controllable antenna element assembly to a signal input of said receiver, and a third
5 connection for coupling the control circuitry to a power supply line of said receiver.

1 12. A receiver apparatus, comprising:

2 a tuner for receiving a broadcast signal from an antenna device;

3 a received broadcast signal processing circuit and for generating at least
4 one signal measurement value from said received broadcast signal;

5 an antenna controller for generating a digital antenna control signal
6 including at least one of gain information, polarization control information, and channel
7 number information, in addition to antenna pattern position control information, the
8 antenna pattern position control information being determined by said antenna controller
9 as a function of said at least one signal measurement value; and

10 a communications channel for outputting the digital antenna control signal
11 to said antenna device.

1 13. The apparatus of claim 12, wherein said received broadcast signal processing
2 circuit is a demodulator and wherein said at least one signal measurement value is a
3 signal to noise estimate.

1 14. The apparatus of claim 12, wherein said communications channel is a serial data
2 bus.

1 15. The apparatus of claim 14, wherein said antenna controller includes:
2 an antenna control and positioning routine used to generate said digital
3 antenna control signal.

1 16. The apparatus of claim 15, wherein said antenna control and position routine
2 includes instructions for rotating said antenna pattern through a plurality of positions to
3 select an optimum position based on said at least one measurement value without human
4 input.

1 17. The apparatus of claim 15, further comprising:
2 stored antenna information received from an antenna device via said serial
3 data bus.

1 18. The apparatus of claim 17, further comprising:
2 stored antenna channel state information specifying settings to be used for
3 a plurality of controllable antenna features for each of a plurality of receiver channel
4 settings.

1 19. The apparatus of claim 14, further comprising:
2 a multi-terminal adapter for connecting said apparatus to an antenna
3 device, the multi-terminal adapter including a first terminal for receiving said broadcast
4 signal from the antenna device, a second terminal for supplying power to said antenna
5 device; and a third terminal for coupling said serial bus to the antenna device.

1 20. The apparatus of claim 14, wherein the received broadcast signal processing
2 circuit is a television signal demodulator circuit.

1 21. A receiver apparatus, comprising:
2 a tuner for receiving a broadcast signal from an antenna device;
3 a received broadcast signal processing circuit and for generating at least
4 one signal measurement value from said received broadcast signal;
5 an antenna controller coupled to said broadcast signal processing circuit
6 for generating digital antenna control signals used to automatically adjust the position of
7 an antenna pattern of said antenna device, the antenna pattern including a plurality of
8 lobes and at least one null so that the null is orientated in the direction of a source of
9 signal interference; and
10 a communications channel for outputting the digital antenna control
11 signals to said antenna device.

1 22. The receiver apparatus of claim 21, wherein said antenna controller further
2 comprises:
3 means for including antenna gain control information in at least some of
4 said digital antenna control signals.

1 23. The receiver apparatus of claim 22, wherein said antenna controller further
2 comprises:
3 means for including channel information in at least some of said digital
4 antenna control signals.

1 24. The receiver apparatus of claim 22, wherein said antenna controller further
2 comprises:
3 means for including antenna polarization information in at least some of
4 said digital antenna control signals.

1 25. A television, comprising:
2 an antenna device having an electronically steerable antenna pattern, the
3 antenna pattern including at least a front lobe, a rear lobe and at least one null, the
4 antenna device including:
5 a control circuit for controlling the position of said antenna pattern
6 in response to digital control signals;
7 a receiver coupled to said antenna device, the receiver including;
8 a demodulator for demodulating broadcast signals received
9 from said antenna device and for generating at least one signal
10 measurement value; and
11 antenna control circuitry for generating a plurality of said
12 digital control signals to steer said antenna pattern as a function of said at
13 least one signal measurement value; and
14 a display device coupled to said demodulator for displaying images
15 generated from said received broadcast signals.

1 26. The television of claim 21, further comprising:
2 a television housing for housing both said antenna device and said
3 receiver.

1 27. The television of claim 21, further comprising:

2 a serial data bus for coupling the antenna control circuitry to the antenna
3 device.

1 28. The television of claim 27, wherein said antenna control circuitry includes means
2 for determining when said antenna pattern position is in a position which produces less
3 signal interference than at least one other antenna pattern position.

1 29. A multi-bit antenna control signal used for controlling characteristics of an
2 antenna, the control signal comprising:
3 a plurality of signal components representing at least two of: a direction
4 field including antenna pattern direction control information, a gain field including
5 antenna gain information, a channel number field including a channel number, and a
6 polarization field including antenna polarization information.

1 30. The multi-bit antenna control signal of claim 29, wherein said plurality of signal
2 components includes said direction field, the direction field including at least three bits.

1 31. The multi-bit antenna control signal of claim 30, wherein the direction field
2 specifies an antenna pattern direction.

1 32. The multi-bit antenna control signal of claim 30, wherein said plurality of signal
2 components further includes said gain field, the gain field including at least two bits used
3 to indicate a level of gain to be applied by an amplifier device in said antenna.

1 33. The multi-bit antenna control signal of claim 30, wherein said plurality of signal
2 components further includes said channel number field, the channel number field
3 including at least three bits used to indicate the number of a broadcast channel to be
4 received by said antenna.

1 34. The multi-bit antenna control signal of claim 30, wherein said plurality of signal
2 components further includes said polarization field, the polarization field including at
3 least one bit used to specify one of a plurality of possible antenna polarizations.

35. A method of controlling an antenna, the method comprising the steps of:
generating at least one digital control signal including a direction
information field and at least one of a gain information field, channel number field, and
polarization information field; and
transmitting said digital control signal to an antenna.

1 36. The method of claim 35, wherein the step of generating a digital control signal
2 includes:
3 measuring a signal characteristic of a broadcast signal received by said
4 antenna.

1 37. The method of claim 36, wherein the step of generating at least one digital control
2 signal includes:
3 measuring the signal to noise ratio of said received broadcast signal; and
4 wherein the method further comprises automatically sending said antenna
5 multiple digital control signals to modify the direction of the antenna pattern of said
6 antenna in an attempt to find a position which results in a satisfactory signal to noise
7 ratio.

38. The method of claim 36, further comprising the step of:
receiving antenna capability information from said antenna.

39. The method of claim 38, wherein the step of transmitting said digital control
signal to an antenna includes the step of transmitting said digital control signal over a
serial bus.

40. The method of claim 39, further comprising the step of:

2 supplying direct current power to said antenna over a line which is
3 separate from said serial bus.

1 41. The method of claim 40, wherein said step of measuring a signal characteristic of
2 a broadcast signal received by said antenna includes:
3 receiving from said antenna the received broadcast signal via a co-axial
4 cable.

1 42. A method of supporting communications in a portable device, the method
2 comprising:
3 providing a plurality of antennas, each of said plurality of antennas
4 supporting adjustable antenna pattern positions;
5 receiving and decoding a signal using a first one of said plurality of
6 antennas while adjusting the antenna pattern position of a second one of said plurality of
7 antennas during a first period of time; and
8 receiving and decoding a signal using the second one of said plurality of
9 antennas while adjusting the antenna pattern position of the first one of said plurality of
10 antennas during a second period of time.

1 43. The method of claim 42, wherein the first and second periods of time are
2 immediately consecutive periods of time.

1 44. The method of claim 42, wherein said signal is a broadband communications
2 signal.

1 45. The method of claim 42, further comprising, at the end of the first period of time,
2 the step of:
3 operating a switching device to disconnect an output of the first antenna to
4 a signal processor and to connect the output of the second antenna to the signal processor.

1 46. A system for receiving broadcast signals, comprising:

2 a plurality of antennas, each antenna having an antenna pattern with a first
3 region having a first gain and a second region having a second gain lower than said first
4 gain, said second region of each of said plurality of antennas being oriented in a different
5 direction from the second region of at least one other antenna in said plurality of
6 antennas; and
7 a receiver coupled to said plurality of antennas, the receiver including a
8 selection device for selecting an antenna signal, output by one of said plurality of
9 antennas, as a function of a signal noise measurement.

1 47. The system of claim 46,
2 wherein said signal noise measurement is a signal to noise ratio
3 measurement; and
4 wherein said receiver further includes:
5 means for generating said signal to noise ratio measurement from the
6 output of an antenna.

1 48. The system of claim 47, wherein said selection device selects the antenna output
2 signal with the lowest signal to noise ratio.

1 49. The system of claim 46, wherein each of said plurality of antennas has the same
2 physical structure but is mounted in said system with a different physical orientation.

1 50. The system of claim 46, wherein at least one of said plurality of antennas has a
2 steerable antenna pattern.

1 51. A receiver system, the system comprising:
2 an antenna with a steerable antenna pattern, the antenna pattern including a high
3 gain region and a low gain region, the low gain region having a gain which is at least six
4 dB lower than the maximum gain in the high gain region; and

5 an antenna pattern position control module for directing the position of said
6 antenna pattern so that the low gain region is positioned in the direction of a source of
7 signal interference.

1 52. The receiver system of claim 51,
2 wherein said antenna pattern position control module generates digital
3 position control signals; and
4 wherein the antenna further comprises:
5 an antenna pattern position control signal decoder module for decoding
6 said digital position control signals.

1 53. The receiver system of claim 52, wherein said antenna pattern position control
2 module includes:
3 means for determining the signal to noise ratio of a signal received from said
4 antenna; and
5 means for generating said digital antenna pattern position control signals to direct
6 said antenna pattern position to a position which maximizes said signal to noise ratio.